(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: PATIENT ANALYSIS AND RESEARCH SYSTEM AND ASSOCIATED METHODS
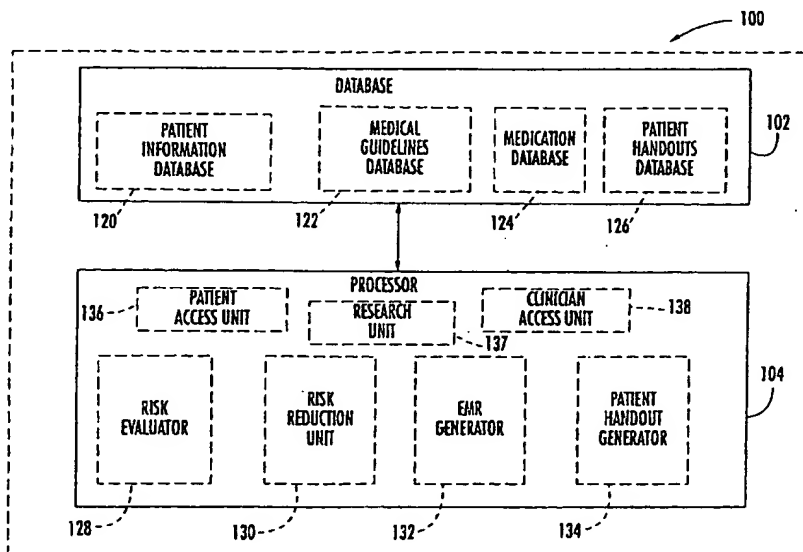
(57) Abstract: The patient analysis and research system and method includes storing a plurality of different medical guidelines for different health conditions, and storing historical patient information data for a plurality of patients. Patient information is collected from users via a global network and evaluated to generate a patient-specific risk report based upon at least one of the different medical guidelines. Also, a physician's patient treatment plan is generated an includes patient-specific recommendations for reducing risk based upon the different medical guidelines, while historical patient information data and patient compliance with the physician's patient treatment plan is correlated to generate outcome-specific research data.

PATIENT ANALYSIS AND RESEARCH SYSTEM
AND ASSOCIATED METHODS

Copyright Notice

10   **Related Applications**

This application is based upon and claims
priority from copending provisional application
Serial No. 60/229,266 filed August 30, 2000, the
disclosure of which is incoporated by reference
15   herein in its entirety.

Field of the Invention

The present invention relates to health care,
and, more particularly, to computerized medical
systems and methods for providing patient risk
20   assessment, medical diagnosis using patient
information and medical guidelines while aggregating
patient data for research.

Background of the Invention

Diagnostic systems, otherwise known as "expert
25   systems" attempt to determine a cause as being the

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production of a plurality of events. Computer based
diagnostic/expert systems are commonplace today and
are applied to diagnosing problems in many different
areas. For example, such systems are utilized to
5   diagnose diseases, to locate geological formations,
and to manage complex systems such as nuclear power
plants, communications networks, etc. In medical
terminology, a diagnostic/expert system attempts to
determine the identity of a disease as being the
10   production of two or more contemporaneous symptoms.

Expert systems are built around a knowledge base
of specific information and an inference or rules
engine. When an expert system is presented with a
problem to solve, the rules engine combines
15   information in the knowledge base with information
about the problem. The rules engine applies its
particular methodology to derive conclusions on the
basis of the information provided. In such a system
the knowledge base is made up of a set of
20   condition/action rules in the form "if...then" or
"yes...no". A problem is presented to the system in
the form of a set of true propositions (e.g.
information obtained from the user). The system
searches for rules which could satisfy a hypothesis
25   and scans current conditions to determine whether the
rule can be applied.

Disease management systems are expert systems
that use a particular rules engine and knowledge base
to automate the diagnosis and/or treatment of a
30   specific disease or condition. For example, U.S.
Publication No. 2001/0012913A1 to Iliff and entitled
"Disease Management System and Method Including
Correlation Assessment" is directed to a system and
method for providing patient access to a an automated
35   system for managing a specific health problem.

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However, the system attempts to take the practice of
medicine out of the hands of physicians and put it
into the hands of patients.

Another example of a medical expert system is
5   U.S. Patent No. 6,188,988 to Barry et al. and
entitled "Systems, Methods and Computer Program
Products for Guiding the Selection of Therapeutic
Treatment Regimens." This system is primarily
concerned with guiding the user to select therapeutic
10 regimens for a known disease such as HIV infection.
This system is not concerned with determining and
reducing a patient's risk relating to a certain
health condition, or using historical patient data
for therapy selection.
15   Also, the number of accepted and standardized
medical practice guidelines for different health
conditions relating to a certain disease, such as
cardiovascular disease, are increasingly becoming
difficult for the physician to manage and assimilate.
20 Being capable of efficiently managing these
guidelines while analyzing patient information and
health trends to identify and reduce patient risk
would reduce the cost of health care such as hospital
stays and follow up care.
25   **Summary of the Invention**
In view of the foregoing background, it is
therefore an object of the invention to provide a
system and method for efficiently and accurately
managing a plurality of medical guidelines while
30 analyzing patient information and health trends to
identify and reduce patient risk for a specific
health condition.

This and other objects, features and advantages
in accordance with the present invention are provided
35 by a patient analysis and research system for use on

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a global network, such as the Internet. The system
includes a guideline database for storing a plurality
of different medical guidelines for different health
conditions, and a research database for storing
5   historical patient information data for a plurality
of patients. A processing device is associated with
the databases for collecting patient information from
users via the global network and includes a risk
evaluator for evaluating the patient information and
10   generating a patient-specific risk report based upon
at least one of the different medical guidelines.
Also, a risk reduction unit evaluates the patient
data and generates a physician's patient treatment
plan including patient-specific recommendations for
15   reducing risk based upon the different medical
guidelines, while a research module correlates
historical patient information data and patient
compliance with the physician's patient treatment
plan to generate outcome-specific research data.
20   The outcome-specific research data may include
health trends, and the risk reduction unit may
generate the physician's patient treatment plan based
upon the health trends. An electronic medical record
(EMR) generator may be provided for generating a
25   patient EMR based upon the patient information, the
risk report and the patient treatment plan, and a
patient handout generator may generate patient-
specific instructions and educational material
including guidelines for at least one of exercise,
30   diet and lifestyle changes based upon the patient
information, the risk report and the patient
treatment plan. The patient information preferably
comprises at least one of gender, age, body mass
index (BMI), cholesterol, blood pressure, allergies,
35   diseases, family disease history, symptoms, lifestyle

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information, and current medications. The different
medical guidelines preferably comprise medical
guidelines for hypertension, diabetes, cholesterol,
obesity and coronary disease. The system may also
5 include a medication database, and the physician's
patient treatment plan may include medication details
and options including contraindications.

Objects, features and advantages in accordance
with the present invention are also provided by a
10 method for analyzing and researching patients using a
global network and including storing a plurality of
different medical guidelines for different health
conditions in a guideline database, storing
historical patient information data for a plurality
15 of patients in a research database, and collecting
patient information from users via the global
network. The method further includes evaluating the
patient information and generating a patient-specific
risk report based upon at least one of the different
20 medical guidelines, evaluating the patient data and
generating a physician's patient treatment plan
including patient-specific recommendations for
reducing risk based upon the different medical
guidelines, and correlating historical patient
25 information data and patient compliance with the
physician's patient treatment plan to generate
outcome-specific research data, such as health
trends. The physician's patient treatment plan may
also be based upon the health trends.

30   **Brief Description of the Drawings**

FIG. 1 is a schematic diagram of the system of
the present invention connected to a global computer
network.

FIG. 2 is a schematic diagram illustrating the
35 details of the system of the present invention.

FIG. 3 illustrates a user interface for collecting patient information used by the system of FIG. 2.

FIGs. 4A-4C are flow charts illustrating an example of the risk evaluation performed by the system of FIG. 2.

FIG. 5 illustrates an example of a risk report generated by the system of FIG. 2.

FIG. 6 is a schematic diagram illustrating the details of an embodiment of the risk reduction unit of the system of FIG. 2.

FIGs. 7A and 7B are flow charts illustrating an example of the analysis performed by the risk reduction unit of FIG. 6.

FIGs. 8A and 8B illustrate an example of a physician's treatment plan generated by the risk reduction unit of FIG. 6.

Detailed Description of the Preferred Embodiments

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

As will be appreciated by those skilled in the art, the present invention may be embodied as a method, data processing system, or computer program product. Accordingly, the present invention may take the form of an entirely hardware embodiment, an

entirely software embodiment, or an embodiment
combining software and hardware aspects. Furthermore,
the present invention may be a computer program
product on a computer-usable storage medium having
5   computer readable program code on the medium. Any
suitable computer readable medium may be utilized
including, but not limited to, static and dynamic
storage devices, hard disks, optical storage devices,
and magnetic storage devices.

10   The present invention is described below with
reference to flowchart illustrations of methods,
systems, and computer program products according to
an embodiment of·the invention. It will be understood
that each block of the flowchart illustrations, and

15 combinations of blocks in the flowchart
illustrations, can be implemented by computer program
instructions. These computer program instructions may
be provided to a processor of a general purpose
computer, special purpose computer, or other

20 programmable data processing apparatus to produce a
machine, such that the instructions, which execute
via the processor of the computer or other
programmable data processing apparatus, implement the
functions specified in the flowchart block or blocks.

25   These computer program instructions may also be
stored in a computer-readable memory that can direct
a computer or other programmable data processing
apparatus to function in a particular manner, such
that the instructions stored in the computer-readable

30 memory result in an article of manufacture including
instructions which implement the function specified
in the flowchart block or blocks. The computer
program instructions may also be loaded onto a
computer or other programmable data processing

35 apparatus to cause a series of operational steps to

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be performed on the computer or other programmable
apparatus to produce a computer implemented process
such that the instructions which execute on the
computer or other programmable apparatus provide
5   steps for implementing the functions specified in the
flowchart block or blocks.

Referring to FIGs. 1 and 2, a patient analysis
and risk reduction system **100** for use on a global
network **106** will now be described. The global
10   network may be an intranet, local area network (LAN)
or wide area network (WAN), for example. However,
for the present invention, the global network **106** is
preferably the Internet, and the system **100** is
preferably implemented as an Application Service
15   Provider (ASP) model utilizing the functionality of
the Internet. As such, the system **100** provides a
comprehensive disease management methodology
delivered to a physician/clinician's office **108**
through the ASP. Accordingly, there is no need to
20   install on-site software and all that is necessary to
access the system **100** from the clinician remote
computer terminal is a web browser and an internet
connection, as would be appreciated by the skilled
artisan.

25   A database **102** at least stores a plurality of
different medical guidelines for different health
conditions, such as cardiovascular disease. The
medical guidelines are based upon accepted and
standardized national or international medical
30   guidelines published by experts in a particular area
of medicine, such as medical guidelines for
hypertension, diabetes, cholesterol, obesity and
coronary disease. For example, the medical guidelines
for hypertension are set forth in the Sixth Report of

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the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC6) convened by the National Institute of Health and published in the Archives of Internal

5 Medicine, Volume 157, page 2413-2446, 1997.

Other examples of medical guidelines include, and are not limited to:

The Executive Summary of the Clinical Guidelines on the Identification, Evaluation and Treatment of

10 Overweight and Obesity in Adults, published by the Expert Panel on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults, convened by the National Institute of Health and published in the Archives of Internal Medicine,

15 Volume 158, page 1855-1867, 1998;

The Smoking Cessation Clinical Practice Guideline, Number 18, published by the Agency for Health Care Policy and Research, April 1996, publication number 96-0692;

20 The Second Report from the Expert Panel on the Detection, Evaluation and Treatment of High Blood Cholesterol in Adults by the National Cholesterol Education Program, published by NIH in the U.S. Dept. of Health and Human Services, NIH publication number

25 93-3095, September 1993;

The 27th Bethesda Conference, Matching the Intensity of Risk Factor Management with Hazards of Coronary Disease, published in the Journal of American College of Cardiology, Volume 27, pages 957-

30 1047, April 1996, endorsed by the American College of Cardiology and the American Heart Association;

The Consensus Panel Statement, Preventing Heart Attack Deaths in Patients with Coronary Artery Disease, published by the American Heart Association,

35 Volume 92, pages 2-4, 1995;

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"A Global Measure of Perceived Stress," Cohen
and Karmarck, Journal of Health and Social Behavior,
Volume 24, pages 385-396, 1983;

Standards of Medical Care for Patients with
5   Diabetes Mellitus, published by the American Diabetes
Association in Diabetes Care, Volume 21, Supplement
One, January 1998, pages F23-F31; and

Diabetes Medical Practice Guidelines by the
State of Florida Agency for Health Care
10   Administration in consultation with the Diabetes
Practice Guideline Advisory Committee, published by
the state of Florida, January 1998.

The database 102 may include a patient
information database 120 for storing patient data, a
15   medical guidelines database 122 for storing the
medical guidelines, a medication database 124 for
storing information on medication including details,
options, indications and contraindications, and a
patient handout database 126 for storing educational
20   material including guidelines for exercise, diet and
lifestyle changes. The patient information database
120, medical guidelines database 122, medication
database 124, and patient handout database 126 are
illustrated as separate blocks of the database 102
25   for ease of understanding; however, it is understood
that the information may be combined and accessed via
associated data addresses as would be readily
apparent to those skilled in the art. Furthermore,
the patient information database 120 may be a
30   research database for storing historical patient
information data for a plurality of patients.

A processor 104 collects patient information
from a user via the global network 106. As
discussed, the user is typically a clinician using a

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remote computer terminal **108** connected to the system **100** via the Internet. The processor **104** includes a risk evaluator **128** for evaluating the patient information and generating a risk report **129** (FIG. 5)

5   based upon at least one of the different medical guidelines, as will be discussed in greater detail below. Also, a risk reduction unit **130** is for evaluating the patient information and generating a physician's patient treatment plan **131** (FIGs. 8A and

10   8B) as will also be discussed in greater detail below. Such a treatment plan **131** includes patient-specific recommendations for reducing risk based upon the different medical guidelines.

A patient handout generator **134** generates

15   patient-specific instructions and educational material including guidelines for exercise, diet and lifestyle changes based upon the patient information, the risk report **129** and the physician's patient treatment plan **131**. The patient handout generator

20   **134** uses the information stored in the patient handout database **126**. An electronic medical record (EMR) generator **132** may be provided for generating a patient EMR based upon the patient information, the risk report **129** and the physician's patient treatment

25   plan **131**. EMR's are known in the art and require no further description herein. Of course, other records, such as progress notes, may be generated for the patient's chart or file.

A research unit **137** provides access to an

30   authorized user of the system **100** via a remote computer terminal **108**, and correlates historical patient information data and patient compliance with the physician's patient treatment plan **131** to generate outcome-specific research data. The outcome-

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specific research data may be used in clinical studies to evaluate and update the medical guidelines, for example. The outcome-specific research data may include health trends, and the risk

5   reduction unit **130** may generate the physician's patient treatment plan **131** based upon the health trends.

Furthermore, a patient access unit **136** permits patient monitored information to be entered by an

10 authorized patient using a remote computer terminal **110** with a secure connection to the system **100** via the global network **106**. The patient monitored information is stored in the patient information database **120** and preferably includes daily blood

15 pressure and blood sugar levels monitored at home by the patient. A clinician access unit **138** permits patient reported information and clinician recorded information to be entered by an authorized clinician using a remote computer terminal **108** with a secure

20 connection to the system **100** via the global network **106**.   The patient reported information and clinician recorded information may be stored in the patient information database **120,** and preferably comprises gender, age, body mass index (BMI), cholesterol,

25 blood pressure, blood sugar, allergies, diseases, family disease history, symptoms, lifestyle information, and current medications.

The patient access unit **136** may also provide access to the patient-specific instructions and

30 educational material, which may be guidelines for hypertension, diabetes, smoking cessation, weight management, nutrition and diet, cholesterol management and stress management.

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Referring to FIG. 3, an example of a user interface **139** accessible via a web browser on one of the computer terminals **108/110** is shown. The data fields for blood pressure and blood sugar may be

5   updatable by both the authorized clinician and authorized patient while the other data fields may only be updated by the authorized clinician. After the patient information is entered, the risk evaluator **128** may operate to perform a risk

10 evaluation, e.g. the risk of cardiovascular disease, for the patient. Referring to FIGs. 4A-4C, a flow chart illustrating an example of the risk evaluation for cardiovascular disease is shown. The risk evaluation includes yes/no/goto logic as would be

15 appreciated by the skilled artisan.

The risk evaluator **128** may then generate the patient risk report **129** as shown, for example, in FIG. 5. As can be seen from the risk report **129**, risk points are assessed for various values of health

20 indicators, such as age, cholesterol, blood pressure etc. Then an overall percent of risk of having a heart attack over the next 10 years is calculated. Such a risk report may be analyzed by the physician, printed for the patient and/or printed for the

25 patient chart.

If the risk report **129** indicates a risk of disease which the physician believes is a concern for the patient's health, a treatment plan may be generated by the risk reduction unit **130**. Of course,

30 the system may also operate to automatically generate the treatment plan by the risk reduction unit **130** if any risk is indicated in the risk report **129** or by the risk evaluator **128**. Referring to FIG. 6, the risk reduction unit **130** may include various analysis

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modules **140-158** which refer to and may be based upon
the medical guidelines stored in the database **102** as
discussed above. These analysis modules **140-158**
correspond to different health conditions relating to
5   the disease for which the patient is at risk. In
this example, the disease is cardiovascular disease
and the analysis modules include, but are not limited
to, diabetes analysis **140**, obesity analysis **142**,
lipid analysis **144**, lipid combination analysis **146**,
10   hypertension analysis **148**, stress reduction analysis
150, secondary prevention analysis **152**, angina
analysis **154**, congestive heart disease analysis **156**
and atrial fibrillation analysis **158**.

       Also, the risk reduction unit **130** may include a
15   user customizable evaluation module **160** for
evaluating the patient data and generating customized
patient-specific recommendations for reducing risk.
For example, if a particular physician wanted to vary
his treatment plan for patients with specific
20   conditions, the customizable evaluation module **160**
may implement that physician's variations for one or
more of the medical guidelines.

       An example of the operation of an analysis
module is illustrated in the flow chart of FIGs. 7A-
25   7B. Specifically, an example of the stress reduction
analysis module **150** which may be based upon and/or
refers to "A Global Measure of Perceived Stress,"
Cohen and Karmarck, Journal of Health and Social
Behavior, Volume 24, pages 385-396, 1983, is shown.
30   Of course the other analysis modules **140-158** may be
similarly implemented with yes/no or if/then rules
which evaluate the patient information.

       Referring now to FIGs. 8A and 8B, a physician's
patient treatment plan **131** may be generated by the

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risk reduction unit **130** after the patient information
has been evaluated. Such a treatment plan **131**
preferably includes at least some of the patient
information collected by the processor **104**, medical

5   guideline recommendations, information for the
physician, medication information, followup
recommendations, patient instructions and/or links to
patient handouts. The patient handout list may
include links to digital versions or hard copies of

10 the handouts which are generated by the patient
handout generator **134**.

        The patient information database **120** may store
the patient information, the risk report **129** and the
physician's patient treatment plan **131**. In such a

15 case, the processor **104** may monitor the patient
information over time and update the risk report **129**
and the physician's patient treatment plan **131**
accordingly.

        The patient handout generator **134** may also

20 generate disease-specific educational material. The
patient-specific instructions and educational
material may include guidelines for hypertension,
diabetes, smoking cessation, weight management,
nutrition and diet, cholesterol management and stress

25 management as discussed above. The physician's
patient treatment plan **131** may include active links
and/or references to the different medical guidelines
used by the risk reduction unit. The physician's
patient treatment plan **131** may include medication

30 details and options including contraindications.
        A method aspect of the invention includes a
method for analyzing patients and reducing risk using
a global network **106** and including storing a
plurality of different medical guidelines for

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different health conditions, collecting patient
information from a user via the global network, and
evaluating the patient information and generating a
risk report **129** based upon at least one of the
5   different medical guidelines. Also, the method
includes evaluating the patient information and
generating a physician's patient treatment plan **131**
including patient-specific recommendations for
reducing risk based upon the different medical
10   guidelines, and generating patient-specific
instructions and educational material including
guidelines for exercise, diet and lifestyle changes
based upon the patient information, the risk report
129 and the physician's patient treatment plan 131.
15   Furthermore, the method may include storing
historical patient information data for a plurality
of patients in the patient information database or
research database **120**, and correlating historical
patient information data and patient compliance with
20   the physician's patient treatment plan **131** to
generate outcome-specific research data, such as
health trends. Subsequently generated patient
treatment plans **131** may also be based upon the health
trends.
25   Also, the method may include storing patient
monitored information, entered by a patient using a
first remote computer **110** via the global network **106**,
in a patient information database **120**, and storing
patient reported information and clinician recorded
30   information, entered by a clinician using a second
remote computer **108** via the global network, in the
patient information database. Permitting access to
the patient-specific instructions and educational
material by the patient using the first remote

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computer **110** via the global network **106** may also be
provided.

    A patient electronic medical record (EMR) based
upon the patient information, the risk report and the
5 physician's patient treatment plan is also preferably
generated. Moreover, the method may include
monitoring the patient information over time and
updating the risk report **129** and the physician's
patient treatment plan **131** based upon updated patient
10 information.

    In sum, the invention is preferably embodied as
a core software application that operates from a
remote personal computer **108** connected to a global
network **106**, such as the Internet, and supports
15 physicians by giving them immediate access to a wide
and deep range of pertinent data and information at
the point of care. The application, run by an
underlying rules engine application that enables
convergence of data, takes seemingly disparate
20 patient data and hunts for risk associated with, for
example, cardiovascular disease. The system is
capable of bringing order, standardization and
consistency to a wide range of healthcare businesses
responsible for disease management and cost
25 containment, and is ideal for physicians and their
extenders working in busy practices in clinical,
hospital and community-based settings. Accessing the
web-enabled application on a standard PC desktop
during the patient visit, the physician or physician
30 extender begins building an electronic medical record
(EMR) for each patient. The program keeps track of
pertinent patient information, such as lab values,
family history, patient demographics, drug therapy,
and the details of the physician-patient encounter.

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Through the collection of this data, the system can then measure patient outcomes, track patient compliance, document the encounter, and include information on specific patient education materials

5   given to the patient. Later, the physician can query the database for specific data such as blood pressure variations, pertinent patient history, and so forth. The system also measures outcomes so that the physician can better track the progress of a patient

10 following a certain protocol to determine whether the treatment is effective.

The system and method facilitates standardization or "reproducibility" of the treatment planning process with options for personalization.

15 The treatment plan produced by the application is comprehensive, containing patient-specific recommendations for medical care and follow-up. In addition, it incorporates patient education materials addressing dietary and exercise recommendations,

20 important medication-related instructions and other information that facilitates self-care and compliance. Copies of the resulting documents may be placed in the patient's medical record, thereby enhancing physician documentation of the patient

25 encounter.

The invention harnesses technology to streamline and optimize disease detection and management processes while ensuring that the power to oversee and individualize patient care stays in the hands of

30 the doctor. The application goes beyond traditional management of disease by incorporating both prevention and detection with a strong emphasis on early risk identification. This system and method was designed with doctors and their extenders in mind.

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Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated
5 drawings. Therefore, it is understood that the invention is not to be limited to the specific embodiments disclosed, and that modifications and embodiments are intended to be included within the scope of the appended claims.

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THAT WHICH IS CLAIMED IS:

1.   A cardiovascular analysis and research
system for use on a global network comprising:
        a guideline database for storing a plurality of
5   different medical guidelines for different health
conditions relating to cardiovascular disease;
        a research database for storing historical
patient information data for a plurality of patients;
        a processing device associated with the
10 databases for collecting patient information from
users via the global network, the processing device
comprising

        a risk evaluating unit for evaluating the
        patient information and generating a patient-
15   specific cardiovascular risk report based upon
        at least one of the different medical
        guidelines,
        a risk reduction unit for evaluating the
        patient data and generating a physician's
20   patient treatment plan including patient-
        specific recommendations for reducing
        cardiovascular risk based upon the different
        medical guidelines, and
        a research unit for correlating historical
25   patient information data and patient compliance
        with the physician's patient treatment plan to
        generate outcome-specific research data.

2.   A cardiovascular analysis and research
system according to Claim 1 wherein the outcome-
30 specific research data includes cardiovascular health
trends.

3.   A cardiovascular analysis and research
system according to Claim 2 wherein the risk
reduction unit generates the physician's patient

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treatment plan also based upon the cardiovascular
health trends.

4.   A cardiovascular analysis and research
system according to Claim 1 wherein the processing
5   device further comprises an electronic medical record
(EMR) generator for generating a patient EMR based
upon the patient information, the cardiovascular risk
report and the patient treatment plan.

5.   A cardiovascular analysis and research
10   system according to Claim 1 wherein the processing
device further comprises a patient handout generator
for generating patient-specific instructions and
educational material including guidelines for at
least one of exercise, diet and lifestyle changes
15   based upon the patient information, the
cardiovascular risk report and the patient treatment
plan.

6.   A cardiovascular analysis and research
system according to Claim 1 wherein the patient
20   information comprises at least one of gender, age,
body mass index (BMI), cholesterol, blood pressure,
allergies, diseases, family disease history,
symptoms, lifestyle information, and current
medications.

25   7.   A cardiovascular analysis and research
system according to Claim 1 wherein the different
medical guidelines comprise medical guidelines for
hypertension, diabetes, cholesterol, obesity and
coronary disease.

30   8.   A cardiovascular analysis and research
system according to Claim 1 wherein the database
further comprises a medication database.

9.   A cardiovascular analysis system according
to Claim 8 wherein the physician's patient treatment

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plan includes medication details and options
including contraindications.

10.   A patient analysis and research system for
use on a global network comprising:

5   a guideline database for storing a plurality of
different medical guidelines for different health
conditions;

a research database for storing historical
patient information data for a plurality of patients;

10   a processing device associated with the
databases for collecting patient information from
users via the global network, the processing device
comprising

a risk evaluating unit for evaluating the
15   patient information and generating a patient-
specific risk report based upon at least one of
the different medical guidelines,

a risk reduction unit for evaluating the
patient data and generating a physician's

20   patient treatment plan including patient-
specific recommendations for reducing risk based
upon the different medical guidelines, and

a research unit for correlating historical
patient information data and patient compliance

25   with the physician's patient treatment plan to
generate outcome-specific research data.

11.   A system according to Claim 10 wherein the
outcome-specific research data includes health
trends.

30   12.   A system according to Claim 11 wherein the
risk reduction unit generates the physician's patient
treatment plan also based upon the health trends.

13.   A system according to Claim 11 wherein the
processing device further comprises an electronic
35 medical record (EMR) generator for generating a

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patient EMR based upon the patient information, the
risk report and the patient treatment plan.

14. A system according to Claim 11 wherein the
processing device further comprises a patient handout
5 generator for generating patient-specific
instructions and educational material including
guidelines for at least one of exercise, diet and
lifestyle changes based upon the patient information,
the risk report and the patient treatment plan.

10   15. A system according to Claim 11 wherein the
patient information comprises at least one of gender,
age, body mass index (BMI), cholesterol, blood
pressure, allergies, diseases, family disease
history, symptoms, lifestyle information, and current
15 medications.

16. A system according to Claim 11 wherein the
different medical guidelines comprise medical
guidelines for hypertension, diabetes, cholesterol,
obesity and coronary disease.

20   17. A system according to Claim 11 wherein the
database further comprises a medication database.

18. A system according to Claim 17 wherein the
physician's patient treatment plan includes
medication details and options including
25 contraindications.

19. A method for analyzing and researching
patients using a global network comprising:
storing a plurality of different medical
guidelines for different health conditions in a
30 guideline database;
storing historical patient information data for
a plurality of patients in a research database;
collecting patient information from users via
the global network;

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evaluating the patient information and
generating a patient-specific risk report based upon
at least one of the different medical guidelines;
    evaluating the patient data and generating a
5   physician's patient treatment plan including patient-
specific recommendations for reducing risk based upon
the different medical guidelines; and
    correlating historical patient information data
and patient compliance with the physician's patient
10 treatment plan to generate outcome-specific research
data.
    20.   A method according to Claim 19 wherein the
outcome-specific research data includes health
trends.
15   21.   A method according to Claim 20 wherein the
physician's patient treatment plan is also based upon
the health trends.
    22.   A method according to Claim 19 further
comprising generating a patient electronic medical
20 record (EMR) based upon the patient information, the
risk report and the patient treatment plan.
    23.   A method according to Claim 19 further
comprising generating patient-specific instructions
and educational material including guidelines for
25 exercise, diet and lifestyle changes based upon the
patient information, the risk report and the patient
treatment plan.
    24.   A method according to Claim 19 wherein the
patient information comprises gender, age, body mass
30 index (BMI), cholesterol, blood pressure, blood
sugar, allergies, diseases, family disease history,
symptoms, lifestyle information, and current
medications.
    25.   A method according to Claim 19 wherein the
35 different medical guidelines comprise medical

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guidelines for hypertension, diabetes, cholesterol, obesity and coronary disease.

26. A method according to Claim 19 further comprising storing medication information in a
5 medication database.

27. A method according to Claim 26 wherein the physician's patient treatment plan includes medication details and options including contraindications.

10 28. A method according to Claim 19 wherein the different health conditions are cardiovascular related conditions, and the risk is cardiovascular disease.

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FIG. 1.

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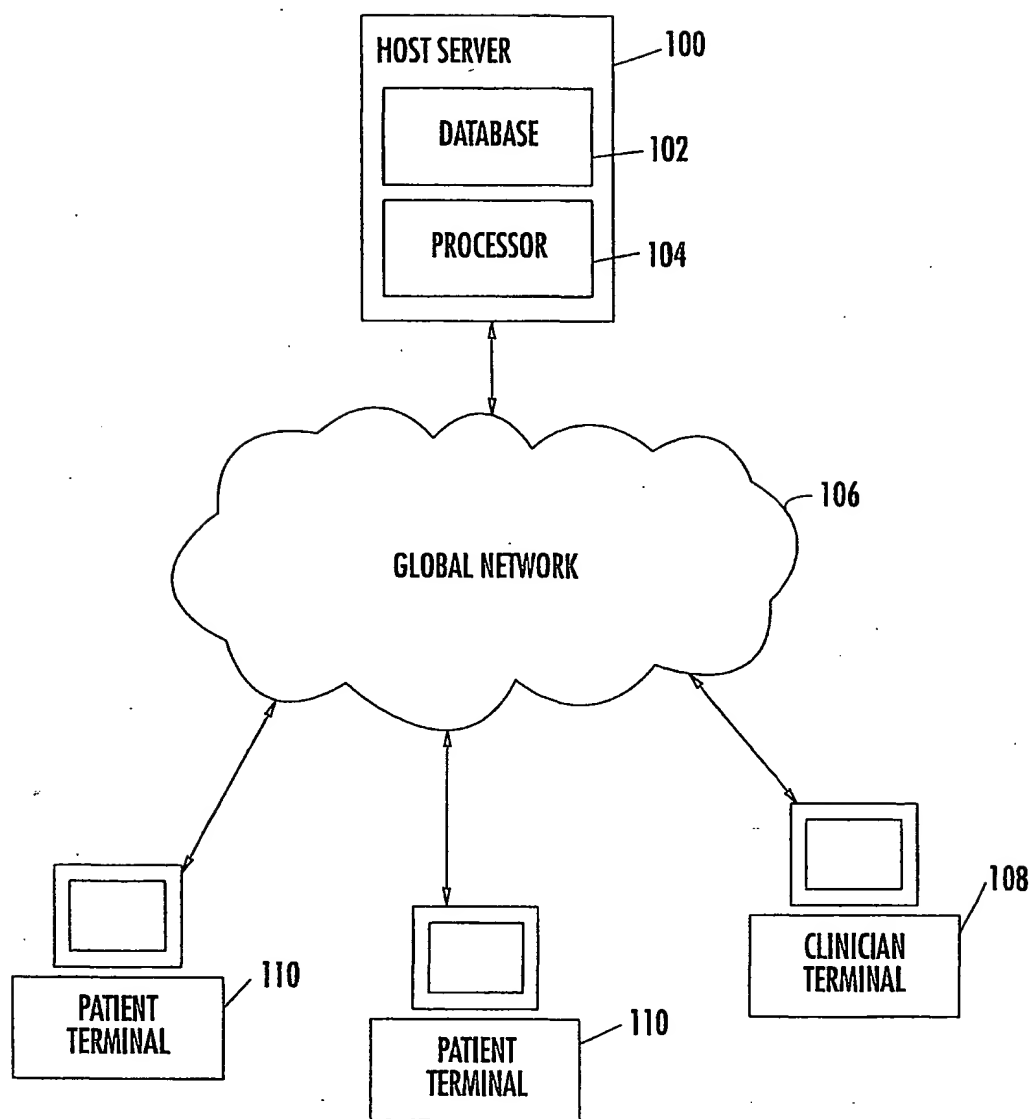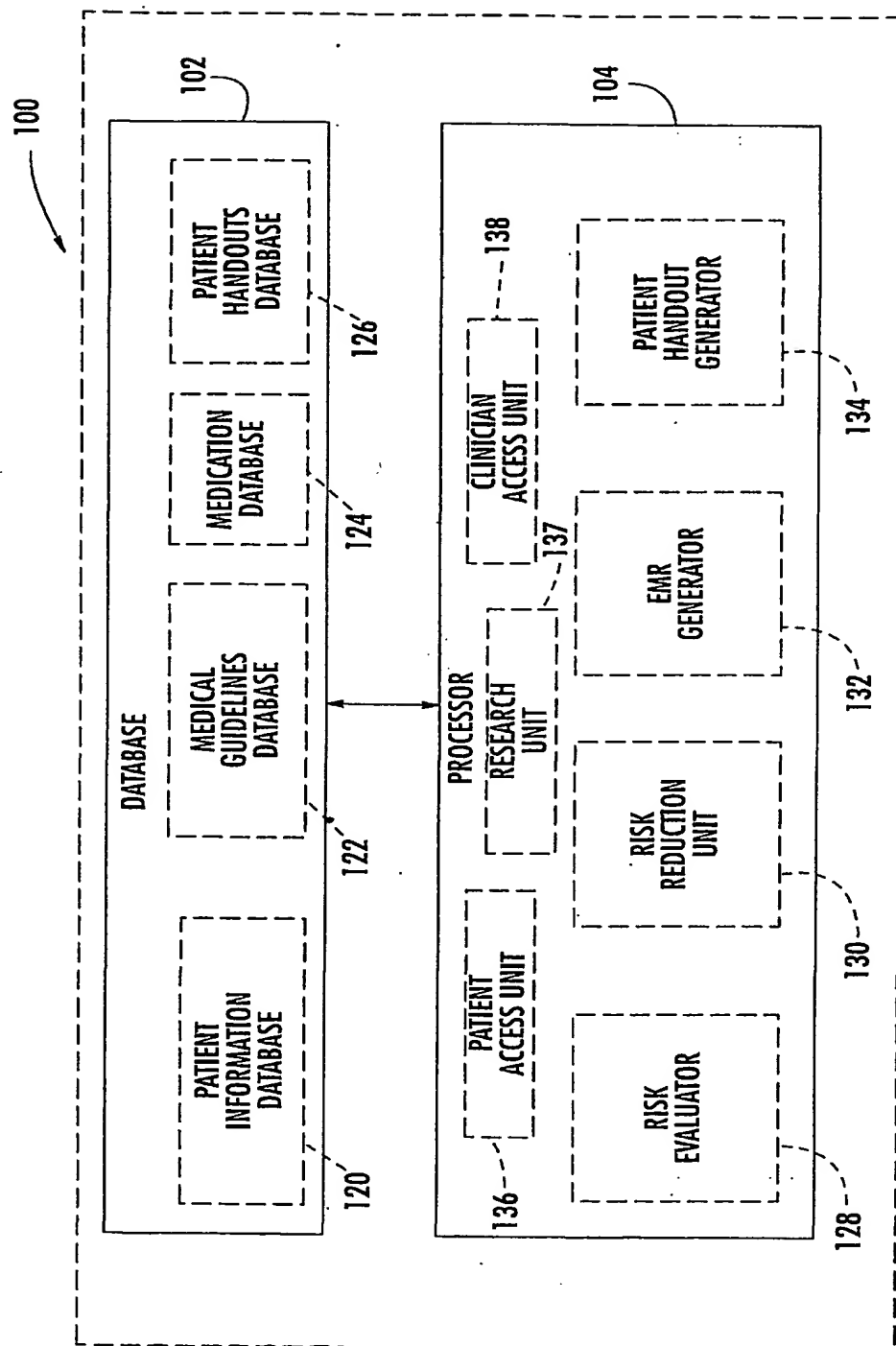
FIG. 2.

PRELIMINARY RISK SCREENING

⊘ DENOTES REQUIRED FIELD

LAST NAME	[_____] ⊘
FIRST NAME	[_____] ⊘
MIDDLE INITIAL	[__]
DOB (MM/DD/YYYY)	[__] / [__] / [____] ⊘
GENDER	[MALE ▼] ⊘
PHONE NUMBER	[__] - [__] - [__]
ADDRESS	[_____]
ADDRESS	[_____]
CITY	[_____]
STATE	[FLORIDA (FL) ▼]
ZIP	[_____] - [____]
COUNTRY	[USA]
E-MAIL	[_____]
PRIMARY CARE PHYSICIAN	[_____]
TOTAL CHOLESTEROL (mg/dL)	[_____] ⊘
HDL (mg/dL)	[_____] ⊘
LDL (mg/dL)	[_____]
ARE YOU A SMOKER?	YES ○ NO ⊙
ARE YOU DIABETIC?	YES ○ NO ⊙
BP (mm/Hg)	SYSTOLIC [____] ⊘ DIASTOLIC [____] ⊘
TREATED FOR HIGH BP?	YES ○ NO ⊙
HEIGHT (INCHES)	[_____] ⊘
WEIGHT (lb.)	[_____] ⊘

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ANALYZE	BACK

FIG. 3.

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FIG. 4A.

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RISK EVALUATION (CONT.)

(A)

SET
MISSING LABS=
FALSE

ARE VALUES KNOWN
FOR ALL OF THE BASIC LABS?
(SBP, DBP, HDL, LDL,
Chol, Trig, FBS)

NO

ORDER HDL, LDL, Chol, Trig, FBS, LFT

"THIS PATIENT'S RECORD INDICATES EITHER
MISSING LAB OR LAB VALUES THAT ARE NOT
CURRENT. RECOMMEND ORDERING A LIPID
PROFILE AND POSSIBLY A LIVER PROFILE
BEFORE DIAGNOSIS BEGINS."

YES

"DEPENDING ON THE PATIENT'S
CARDIOVASCULAR RISK ASSESSMENT, YOU
MAY WISH TO CONSIDER ORDERING A LIPID
PARTICLE SIZE EVALUATION. THERE ARE
CURRENTLY THREE TESTS AVAILABLE:
SPECTROSCOPIC ANALYSIS BY LIPOMED,
ELECTROPHORESIS BY BERKELEY, AND
ULTRACENTRIFICATION BY ATHEROTEC. FOR
ADDITIONAL INFORMATION, PLEASE CONTACT
THE LAB DIRECTLY."

LAB VALUES>1
YEAR OLD?

YES

NO

DO WE HAVE AN
"AT RISK" CONDITION?
(FhyCADMate, FhyCADFemale, CAD, DM,
HIGHLDL, LOWHDL, HIGHTrig, HIGHLpa
LDLPATTERNB, CHF, PVD, CVD,
ABruit, CBruit)

SET
MISSING LABS=
TRUE

"CONTACT INFORMATION FOR LABS:
LIPOMED AT (919)212-1919 OR
"WWW.LIPOPROFILE.COM"
BERKELEY HEART LAB AT (650)372-1960
OR "WWW.BERKELEYHEARTLAB.COM"
ATHEROTECH AT 800-719-9817 OR
VAP@ATHEROTECH.COM"

GO TO
B

"SOME PHYSICIANS ARE USING Lp(a)
VALUES TO HELP GUIDE CARDIOVASCULAR
TREATMENT. AT THIS TIME, ALL DATA
REGARDING Lp(a) IS EPIDEMIOLOGIC
SINCE THERE ARE CURRENTLY NO CLINICAL
OUTCOMES TRIALS PUBLISHED WITH
ACCEPTED GUIDELINES FOR TREATMENT,
HEALTHEHEART.COM PROVIDES
DOCUMENTATION FIELDS FOR THIS VALUE. AT
THIS TIME, WE DO NOT USE THIS VALUE AS A
BASIS FOR TREATMENT GUIDELINES."

FIG. 4B.

RISK EVALUATION (CONT.)

(B)

DOES PATIENT HAVE HIGH LDL?
(HIGHLDL) OR (RFL<2 AND LDL>130)
OR (RFL>=2 AND LDL>130) OR (CAD
OR PVD OR CVD AND LDL>100) — YES → SET HIGHLDL= TRUE

NO ↓

DOES PATIENT HAVE LOW
HDL OR HDL<35?
(LOWHDL, HDL) — YES → SET LOWHDL= TRUE

NO ↓

DOES PATIENT HAVE HIGH
Trig OR Trig>200?
(HIGH Trig, Trig) — YES → SET HIGHTrig= TRUE

NO ↓

DOES PATIENT HAVE HIGH
Lp(a) OR Lp(a)>35?
(HIGH Lpa, Lpa) — YES → SET HIGHLpa= TRUE

NO ↓

DOES PATIENT HAVE HLDL
OR LHDL OR HTrig OR LDL
PATTERN B?
(LDL PATTERNB) — YES/NO → SET LDL PATTERNB =TRUE → ENTER LIPID ANALYSIS

IS PATIENT HYPERTENSIVE?
(HTN OR SBP>135 OR
DBP>85) — YES → ENTER HYPERTENSION ANALYSIS

NO

IS THE PATIENT A SMOKER?
(SMOKE) — YES → ENTER SMOKING ANALYSIS

NO ↓

IS PATIENT DIABETIC OR
HAVE FBS>126?
(DM OR FBS) — YES → ENTER DIABETES ANALYSIS

NO ↓

SET BMIc=
WEIGHT/HEIGHT
(kg/m2)

DOES PATIENT HAVE
OBESITY? (OBESITY OR
BMI>30 OR (CAD OR
DM OR HTN OR HIGHLDL
OR LOWHDL OR CHF AND
BMI>27)) — YES → ENTER OBESITY ANALYSIS

NO ↓

HAS PATIENT HAD A HEART
ATTACK? (MIDate)(THIS IS
ALSO REFERRED TO AS
MYOCARDIAL INFARCTION
OR MI) — YES → ENTER SECONDARY PREVENTION ANALYSIS

NO ↓

DOES THE PATIENT NEED
STRESS INTERVENTION? — YES → ENTER STRESS ANALYSIS

NO

END

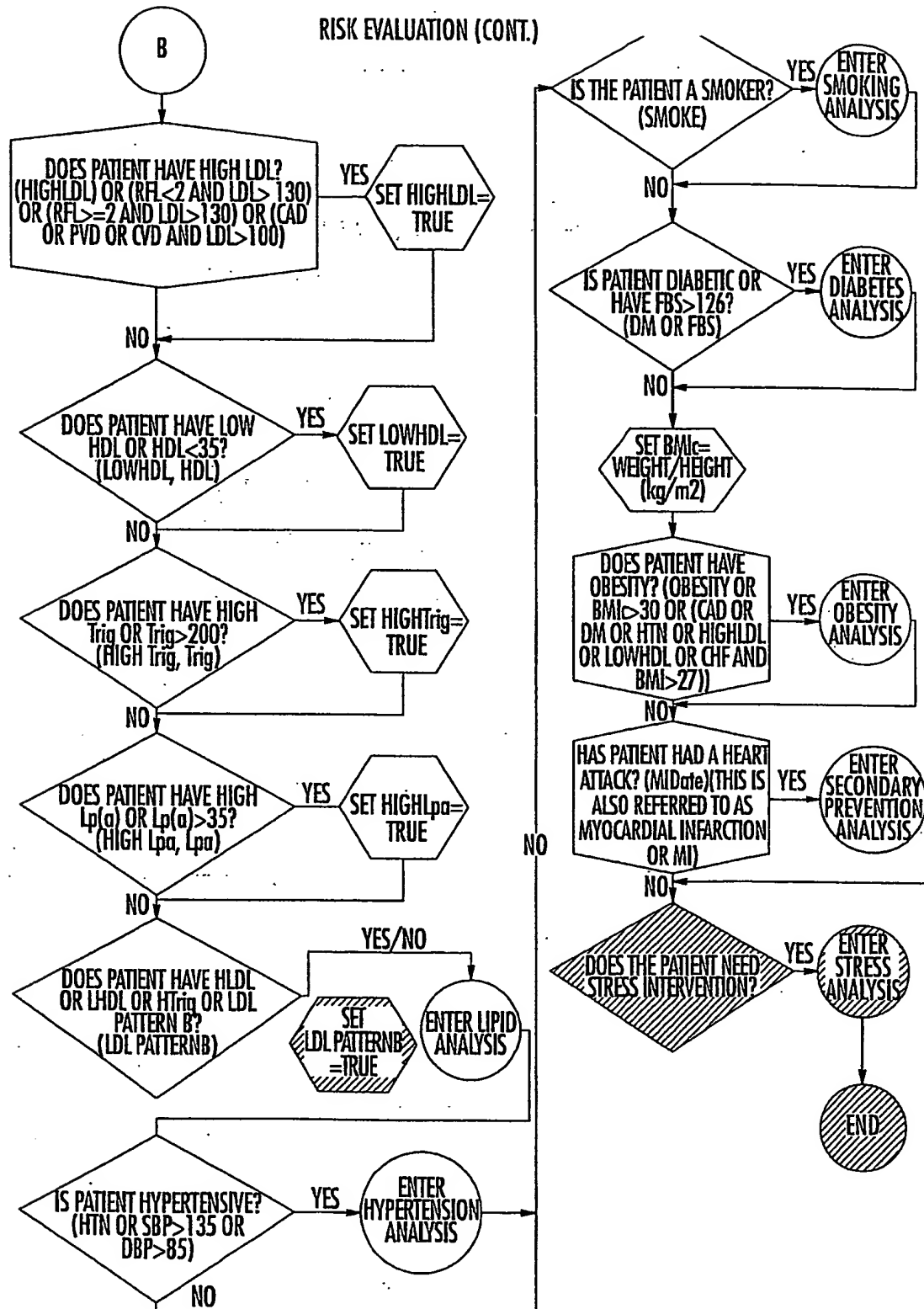*FIG. 4C.*

RISK REPORT

CALCULATED FOR: GERARD McGANN

AGE: 47   SEX: MALE   DATE: AUGUST 15, 0000

PRIMARY CARE MD:

BASED ON YOUR PERSONAL HEALTH INDICATORS, YOUR PHYSICIAN HAS COMPUTED YOUR RISK LEVELS FOR HEART ATTACK BASED ON THE LATEST INFORMATION FROM THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION PROVIDED BY THE HEALTHEHEART COMPUTERIZED ASSESSMENT SERVICE.

10 YEAR CORONARY HEART DISEASE RISK ASSESMENT

HEALTH INDICATOR	VALUE	RISK POINTS
PATIENT AGE	47	3
TOTAL CHOLESTEROL, mg/dL	245	6
HDL CHOLESTEROL, mg/dL (PROTECTIVE CHOLESTEROL)	32	2
SYSTOLIC BLOOD PRESSURE, mm Hg	160	2
SMOKING	Y	5
TOTAL RISK POINTS		18
PERCENT OF RISK FOR HEART ATTACK (OVER THE NEXT 10 YEARS)		30%

REDUCTION OF RISK POINTS BY TWO ADDITIONAL POINTS WOULD REDUCE YOUR 10 YEAR RISK OF HEART ATTACK TO 25%

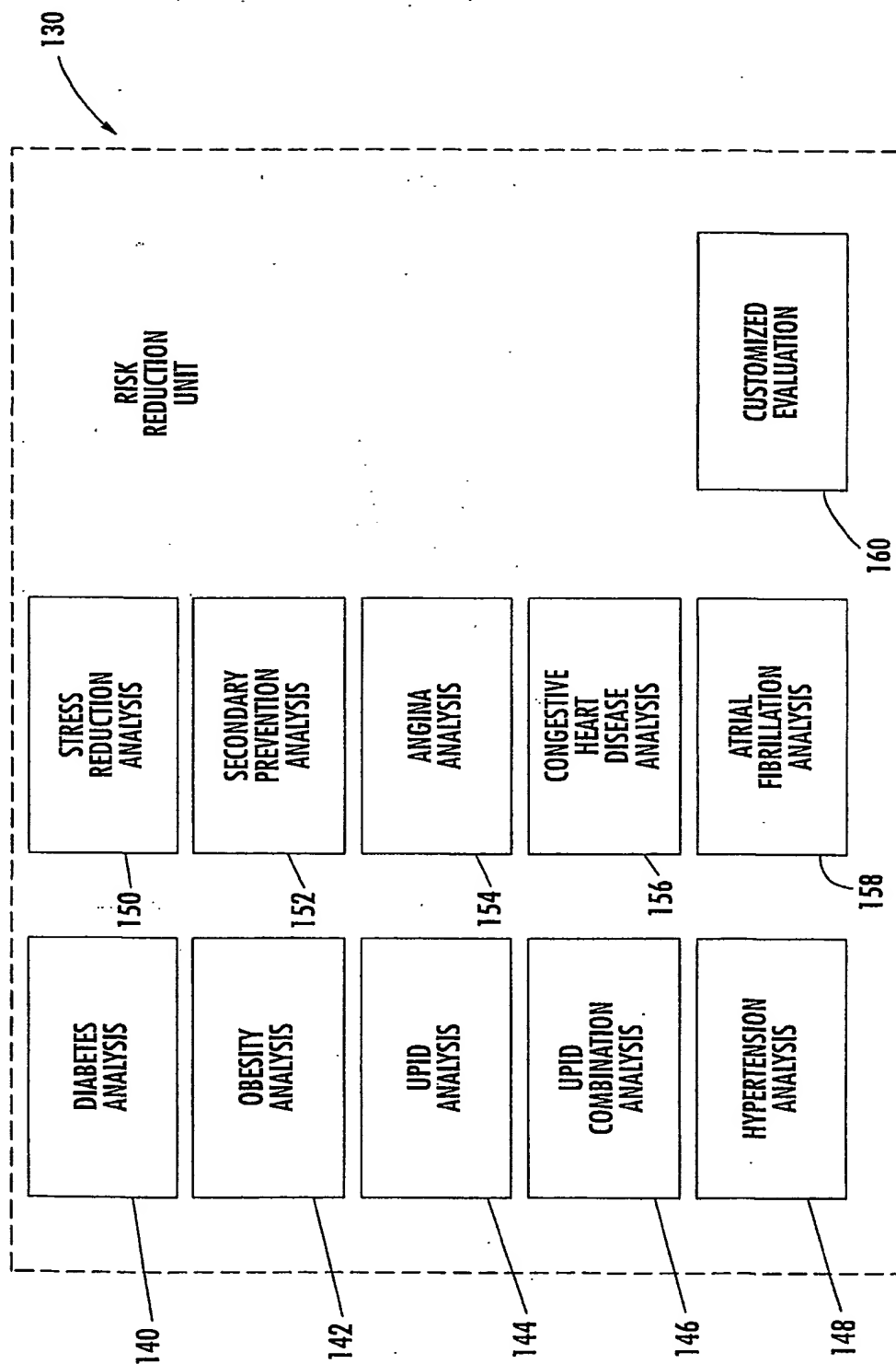THE BMI OF THE PATIENT IS 41.20

RISK GOAL: 3
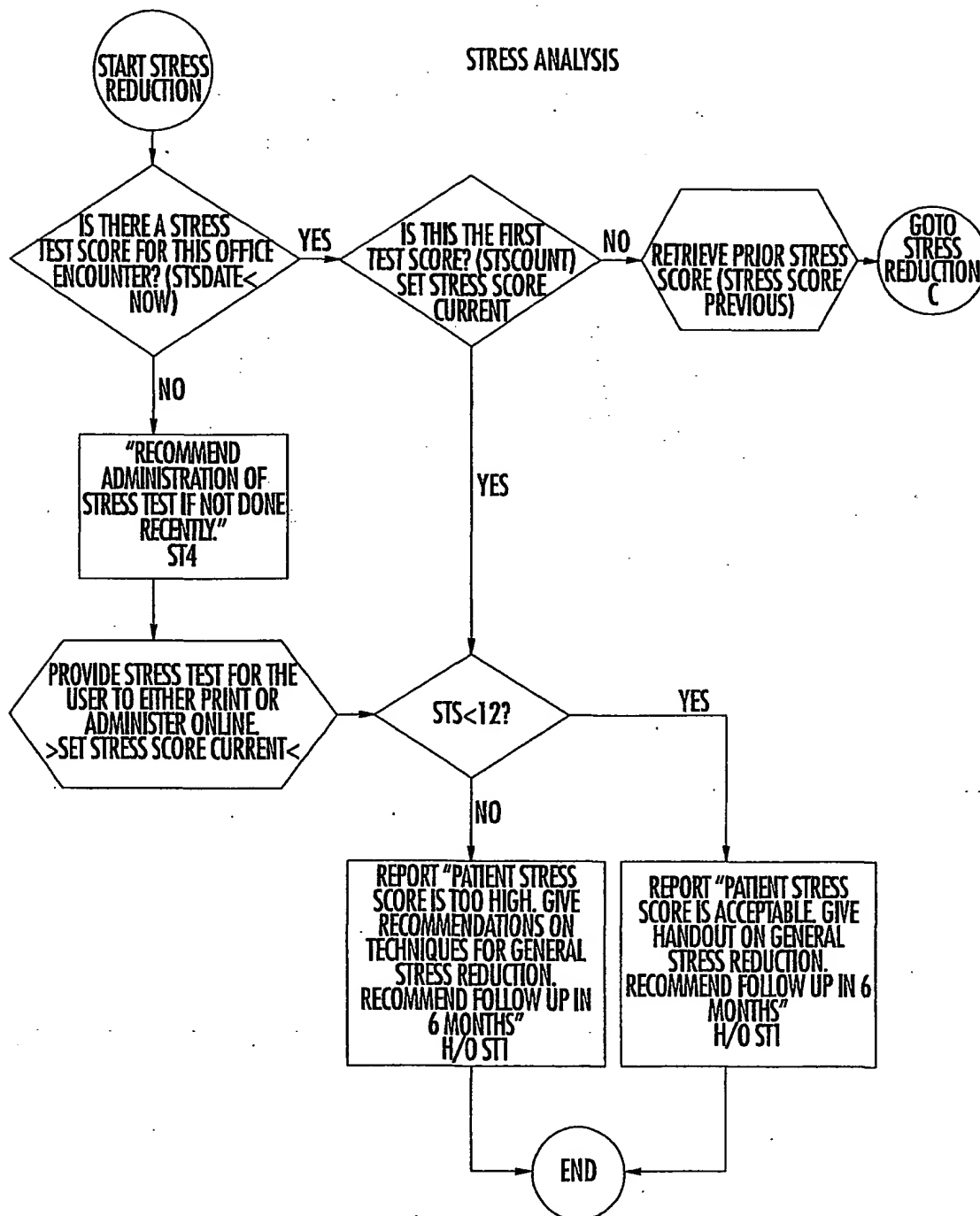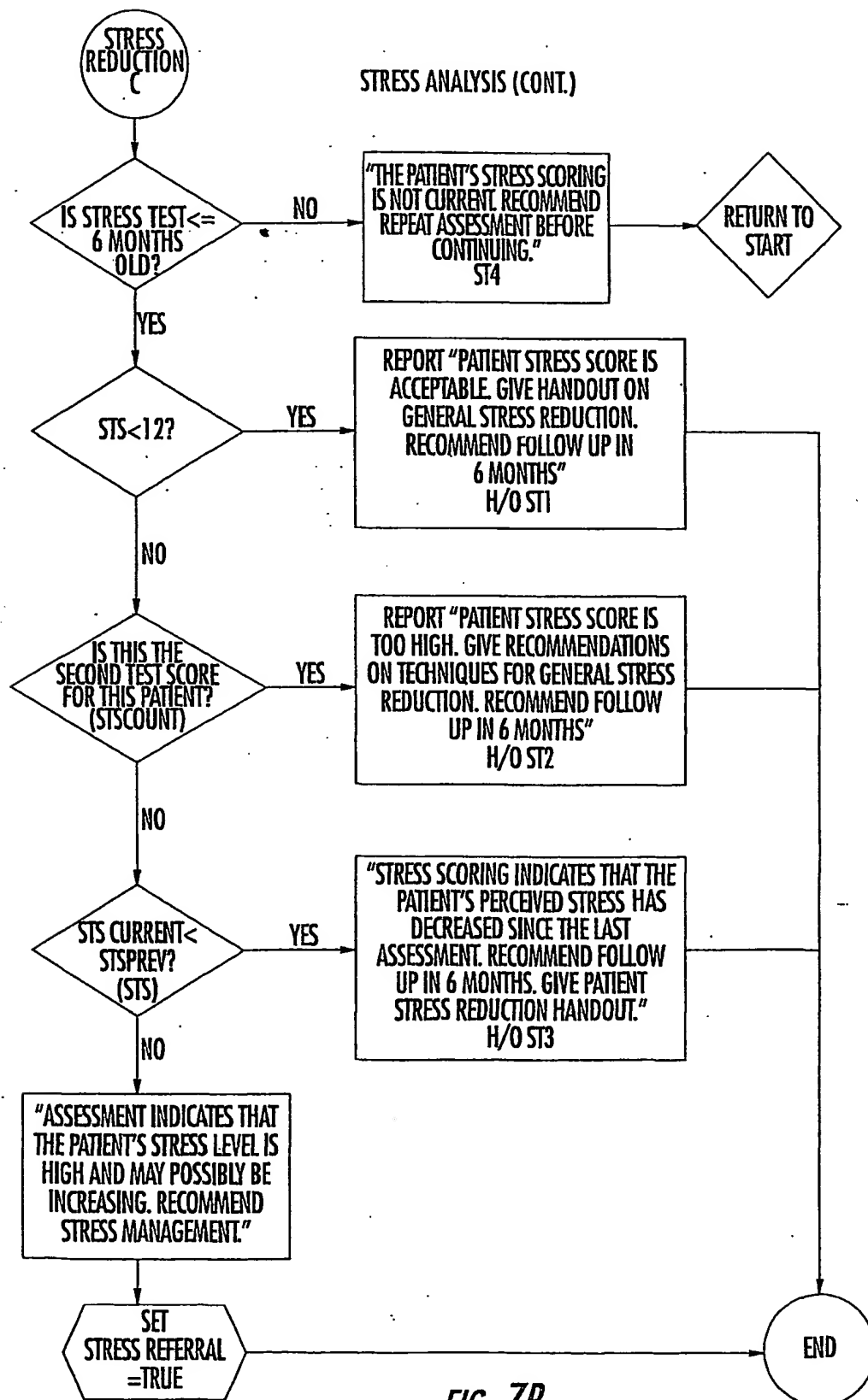
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FIG. 5.

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FIG. 6.

STRESS ANALYSIS

START STRESS
REDUCTION

IS THERE A STRESS
TEST SCORE FOR THIS OFFICE
ENCOUNTER? (STSDATE<
NOW)

YES

IS THIS THE FIRST
TEST SCORE? (STSCOUNT)
SET STRESS SCORE
CURRENT

NO

RETRIEVE PRIOR STRESS
SCORE (STRESS SCORE
PREVIOUS)

GOTO
STRESS
REDUCTION
C

NO

"RECOMMEND
ADMINISTRATION OF
STRESS TEST IF NOT DONE
RECENTLY."
ST4

YES

PROVIDE STRESS TEST FOR THE
USER TO EITHER PRINT OR
ADMINISTER ONLINE.
>SET STRESS SCORE CURRENT<

STS<12?

YES

NO

REPORT "PATIENT STRESS
SCORE IS TOO HIGH. GIVE
RECOMMENDATIONS ON
TECHNIQUES FOR GENERAL
STRESS REDUCTION.
RECOMMEND FOLLOW UP IN
6 MONTHS"
H/O ST1

REPORT "PATIENT STRESS
SCORE IS ACCEPTABLE. GIVE
HANDOUT ON GENERAL
STRESS REDUCTION.
RECOMMEND FOLLOW UP IN 6
MONTHS"
H/O ST1

END

FIG. 7A.

FIG. 7R

>PATIENT INFORMATION

DOE, JOHN   CHART #: 1   SSN: 234-23-1640
MALE, WHITE/CAUCASION   DOB: 09/05/1960   FIRST VISIT: 06/26/2001

>VASCULAR HISTORY
• NONE

>PATIENT RISK FACTORS
• HIGH LDL   • LOW HDL   • SMOKER   • HYPERTENSION   • OBESITY

>ADDITIONAL MEDICAL HISTORY
• NONE

>NATIONAL GUIDELINE RECOMMENDATIONS
• THE RECORD INDICATES THAT THE PATIENT HAS MULTIPLE CONDITIONS PLACING THEM AT
"BORDERLINE-HIGH RISK" FOR THE DEVELOPMENT OF, OR INCREASE IN, CARDIOVASCULAR DISEASE.
• FOR THESE PATIENTS, THE NATIONAL CHOLESTEROL EDUCATION PROGRAM (NCEP) RECOMMENDS
AN LDL-CHOLESTEROL GOAL OF LESS THAN 130 mg/dL.

MODIFICATIONS AND FOLLOW UP OFFICE VISIT IN 4-6 WEEKS.
>PHYSICIAN INFORMATION
• SECONDARY CAUSES OF HYPERLIPIDEMIA
• SECONDARY CAUSES OF OBESITY

>PHARMOCOTHERAPY RECOMMENDATIONS
• THE LDL-CHOLESTEROL IS ABOVE GOAL BUT NOT HIGH ENOUGH TO MEET THE NCEP CRITERIA FOR
PHARMACOLOGIC THERAPY.
• RECOMMEND INITIATION OF DIETARY MEASURES TO REDUCE LDL-CHOLESTEROL, REGULAR
EXERCISE, AND LIFESTYLE MODIFICATION TO HELP REDUCE CARDIOVASCULAR RISK.
• REPEAT LIPID PROFILE TESTING IN 4-6 WEEKS.

>DRUGS INITIATED
NONE AT THIS TIME
>DRUGS PRIOR TO VISIT
GENERIC NAME   BRANDNAME   DOSAGE SCHEDULE
                         ATIVAN   0.5mg/prn
                         PRILOSEC   20mg/qhs

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FIG. 8A.

FIG. 8L

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>FOLLOWUP RECOMMENDATIONS
•RECOMMEND PATIENT INCREASE HDL-CHOLESTEROL THROUGH INITIATION OF DIETARY MEASURES, ROUTINE EXERCISE, AND LIFESTYLE MODIFICATION.
•FOLLOW UP LIPID PROFILE RECOMMENDED IN 6 MONTHS UNLESS OTHER LIPID RISKS WARRANT TESTING SOONER.
• THE RECORD INDICATES THAT THE PATIENT IS CONSIDERED CLINICALLY OBESE AND NOT CURRENTLY ON A TREATMENT PLAN.
•RECOMMEND PATIENT EDUCATION REGARDING DIET, EXERCISE, AND LIFESTYLE MODIFICATION BEFORE BEGINNING PRESCRIPTION THERAPY.
• FOLLOW UP OFFICE VISIT IN 1 MONTH.
• ADVISE PATIENT THAT SHOULD SERIOUSLY CONSIDER QUITTING SMOKING.
• GIVE FOLLOW UP CALLS IN ONE WEEK AND THREE WEEKS TO PATIENT'S HOME

>PATIENT RECOMMENDATIONS
• YOUR PHYSICIAN HAS DETERMINED THAT YOU NEED MEDICATIONS TO HELP MANAGE YOUR BLOOD PRESSURE. TAKE THESE MEDICINES EXACTLY AS PRESCRIBED AND CONTINUE LIFESTYLE AND DIET MODIFICATIONS TO OPTIMIZE YOUR MEDICATION ROUTINE.
• RECOMMEND FOLLOW UP OFFICE VISIT IN 4-6 WEEKS AND MAINTAINING A BLOOD PRESSURE DIARY FOR YOUR PHYSICIAN TO REVIEW.

>PATIENT HANDOUTS
•INTRODUCTION TO CHOLESTEROL AND TRIGLYCERIDES
•REDUCING CHOLESTEROL THROUGH DIET
•LOW HIGH DENSITY LIPOPROTEIN CHOLESTEROL
•INCREASING HDL
•LOW HIGH DENSITY LIPOPROTEIN WITH NO DRUG THERAPY REQUIRED
•OBESITY
•YOU CAN STOP SMOKING

BACK   CLOSE   PRINT FOR PATIENT   PRINT FOR PHYSICIAN

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